

What is claimed is:

1. A blood sugar level measuring apparatus comprising:

a heat amount measuring portion for measuring a plurality of temperatures derived from a body surface and obtaining information used for calculating the amount of heat transferred by convection and the amount of heat transferred by radiation, both related to the dissipation of heat from said body surface;

a blood flow volume-measuring portion for obtaining information about blood flow volume;

a first storage portion in which information about blood hemoglobin concentration and blood hemoglobin oxygen saturation is stored;

a second storage portion in which a relationship between parameters corresponding to said plurality of temperatures and to an oxygen supply volume and a blood sugar level is stored, said oxygen supply volume being determined from said hemoglobin concentration, said hemoglobin oxygen saturation and said blood flow volume;

an arithmetic portion for converting a plurality of measurement values inputted from said heat amount measuring portion and said blood flow volume measuring portion into said parameters individually, and calculating said blood sugar level by applying said parameters to said relationship stored in said second storage portion; and

a display portion for displaying the blood sugar level calculated by said arithmetic portion,

wherein:

said blood flow volume measuring portion comprises a body-surface contact portion, an indirect temperature detector for detecting the temperature at a position distanced from the body-surface contact portion, and a heat-conducting member connecting said body-surface contact portion and said indirect temperature detector.

2. The blood sugar level measuring apparatus according to claim 1, wherein said blood flow volume measuring portion comprises an adjacent temperature detector disposed adjacent to said body-surface contact portion.
3. The blood sugar level measuring apparatus according to claim 1, wherein said heat-amount measuring portion comprises an ambient temperature detector for measuring ambient temperature and a radiation temperature detector for measuring radiation heat from the body surface.
4. The blood sugar level measuring apparatus according to claim 1, wherein said first storage portion stores information about blood hemoglobin concentration and information about blood hemoglobin oxygen saturation separately.
5. The blood sugar level measuring apparatus according to claim 1, wherein said first storage portion stores information about the product of blood hemoglobin concentration and hemoglobin oxygen saturation.
6. The blood sugar level measuring apparatus according to claim 1, wherein said information about blood hemoglobin concentration and said information about blood hemoglobin oxygen saturation are those of the blood hemoglobin concentration and hemoglobin oxygen saturation, respectively, when resting.
7. A blood sugar level measuring apparatus comprising:
 - a temperature measuring portion for measuring a plurality of temperatures from a body surface;
 - a blood flow volume measuring portion for obtaining information about blood flow volume using the result of measurement by said temperature measuring portion;
 - a first storage portion in which information about blood hemoglobin

concentration and hemoglobin oxygen saturation is stored;

a second storage portion in which a relationship between parameters and a blood sugar level is stored, said parameters corresponding to said plurality of temperatures and to oxygen supply volume individually, said oxygen supply volume being obtained based on the result of measurement by said blood flow volume measuring portion and information about the hemoglobin concentration and hemoglobin oxygen saturation in blood that are stored in said first storage portion;

an arithmetic portion for converting measurement values inputted from said temperature measuring portion and said blood flow volume measuring portion into said parameters, and calculating a blood sugar level by applying said parameters to said relationship stored in said second storage portion; and

a display portion for displaying the blood sugar level calculated by said arithmetic portion.

8. The blood sugar level measuring apparatus according to claim 7, wherein said blood flow volume measuring portion comprises a body-surface contact portion, an adjacent temperature detector disposed adjacent to said body-surface contact portion, an indirect temperature detector for detecting the temperature at a position distanced from said body-surface contact portion, and a heat-conducting member connecting said body-surface contact portion and said indirect temperature detector.

9. The blood sugar level measuring apparatus according to claim 7, wherein said first storage portion stores information about blood hemoglobin concentration and information about blood hemoglobin oxygen saturation separately.

10. The blood sugar level measuring apparatus according to claim 7, wherein said first storage portion stores information about the product of blood hemoglobin

concentration and hemoglobin oxygen saturation.

11. The blood sugar level measuring apparatus according to claim 7, wherein said information about blood hemoglobin concentration and said information about blood hemoglobin oxygen saturation are those of the blood hemoglobin concentration and hemoglobin oxygen saturation, respectively, when resting.

12. A blood sugar level measuring apparatus comprising:

an ambient temperature measuring unit for measuring ambient temperature;

a body-surface contact portion with which a body surface comes into contact;

a radiation heat detector for measuring radiation heat from said body surface;

a heat-conducting member disposed adjacent to said body-surface contact portion;

an indirect temperature detector disposed adjacent to said heat-conducting member and away from said body-surface contact portion, for detecting the temperature at a position distanced from said body-surface contact portion;

a first storage portion in which information about blood hemoglobin concentration and hemoglobin oxygen saturation is stored;

an arithmetic portion including a converting portion for converting the outputs of said indirect temperature detector, said ambient temperature measuring unit and said radiation heat detector into a plurality of parameters, and a processing portion in which a relationship between said parameters and a blood sugar level is stored, said processing portion being adapted to calculate a blood sugar level by applying said parameters to said relationship; and

a display portion for displaying the blood sugar level outputted from said arithmetic portion.

13. The blood sugar level measuring apparatus according to claim 12, further comprising a plate with which an open end of said heat-conducting member adjacent to said body-surface contact portion is covered, and an adjacent temperature detector for detecting the temperature of said plate, wherein the output of said adjacent temperature detector is converted into said parameters by said converting portion.

14. The blood sugar level measuring apparatus according to claim 13, wherein the heat conductivity of said plate is higher than that of said heat-conducting member.

15. The blood sugar level measuring apparatus according to claim 12, wherein the information about blood hemoglobin concentration and said information about blood hemoglobin oxygen saturation are those of the blood hemoglobin concentration and hemoglobin oxygen saturation when resting.

16. A blood sugar level measuring apparatus comprising:

an ambient temperature measuring unit for measuring ambient temperature;

a body-surface contact portion with which a body surface comes into contact;

a heat-conducting member disposed adjacent to a first area of said body-surface contact portion;

an indirect temperature detector disposed adjacent to said heat-conducting member and away from said body-surface contact portion, for detecting the temperature at a point distanced from said body-surface contact portion;

a tubular member disposed adjacent to a second area of said body-surface contact portion, one end of said tubular member being open;

a radiation heat detector disposed adjacent to the other end of said tubular

member, for measuring radiation heat from said body surface;

a first storage portion in which information about blood hemoglobin concentration and hemoglobin oxygen saturation is stored;

an arithmetic portion including a converting portion for converting the outputs of said indirect temperature detector, said ambient temperature measuring unit and said radiation heat detector into a plurality of parameters, and a processing portion in which a relationship between said parameters and a blood sugar level is stored in advance, said processing portion being adapted to calculate a blood sugar level by applying said parameters to said relationship; and

a display portion for displaying the blood sugar level outputted from said arithmetic portion.

17. The blood sugar level measuring apparatus according to claim 16, wherein said first and second areas are disposed adjacent to each other.

18. The blood sugar level measuring apparatus according to claim 16, wherein said information about blood hemoglobin concentration and said information about blood hemoglobin oxygen saturation are those of the blood hemoglobin concentration and hemoglobin oxygen saturation, respectively, when resting.